In the Drawings:

Replace Fig. 5a with the enclosed Replacement Sheet. (Fig. 5a is the only figure on the Replacement Sheet.)

REMARKS

This paper is submitted in response to the Office Action mailed June 28, 2005. (The undersigned and colleagues at Stoel Rives LLP were granted power of attorney by appointment apparently faxed to the PTO on or about August 1, 2005.) Claims 1-40 are pending.

The title is amended to read: FREQUENCY DRIFT COMPENSATION ACROSS MULTIPLE BROADBAND SIGNALS IN A DIGITAL RECEIVER SYSTEM to more accurately reflect the subject matter of the invention.[1]

The Examiner objected to drawing Figure 5a; a corrected replacement drawing is submitted herewith on a single Replacement Sheet. Figure 5a is amended to show the input from the Averager 450 of Figure 4.

The Examiner rejected various claims because of informalities, such as the non-essential use of quotation marks within parenthetical definitions of acronyms. See Office Action at page 3. These informalities are corrected in the claim amendments above. They are understood to be matters of form not affecting the scope or meaning of the claims.

Claims 1-40 were rejected as discussed below. Claims 1-5, 7, 8, 11, 12, 14, 21, 25, 27, 30, 34, 36, 37, and 40 are currently amended. Claim 17 is canceled. Applicant respectfully traverses the rejections for the reasons explained below and requests reconsideration.

1. Multiple carrier signals is very different from multi-path instances of one signal.

At page 4, the Examiner rejected claims 1-8, 12-18, 21-27 and 30-37 under 35 U.S.C. §103(a) as unpatentable over Sih et al. U.S. Pat. No. 6,608,858 B (hereinafter "Sih") in view of Kuo, U.S. Pat. No. 6,647,055 B2 (hereinafter "Kuo"). Applicant respectfully traverses these rejections and requests reconsideration for the following reasons.

Sih is directed to "Multi-path Doppler Adjusted Frequency Tracking Loop". It teaches improved frequency tracking/ adjustments in a receiver to compensate for variations in Doppler shift across the fingers of a RAKE or "diversity" receiver. That receiver attempts to aggregate (coherently sum) multi-path instances of the same signal – i.e., a single CDMA digital wireless call.

[1] The prior title appears to be an artifact of a related application.

The multi-path problem is illustrated in Sih's Fig. 4; it shows four paths – three of them originate at base stations and one is reflected off a building. To similar effect, see the multi-path illustrations in Kuo Fig. 1a-1b.

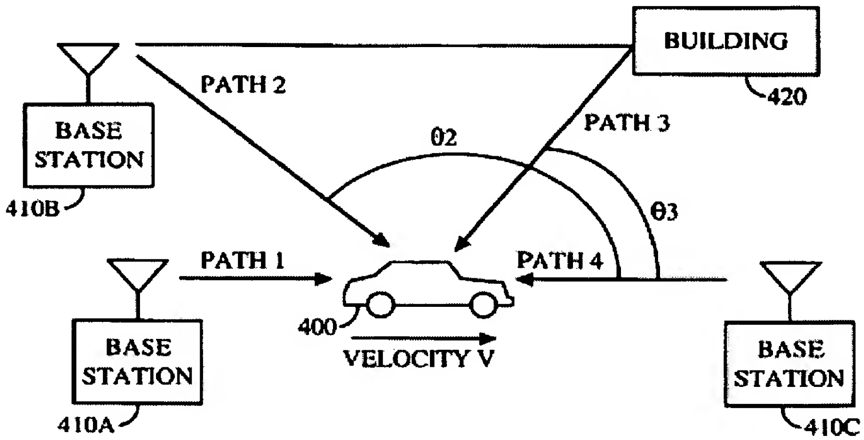

FIG. 4

CDMA handsets use RAKE receivers to track these multiple paths for a single call or narrowband channel. As explained: "Each strong path is tracked by a finger that performs despreading, walsh decovering and accumulation, pilot time and frequency tracking, and symbol demodulation." See column 3, lines 2-9. Sih thus address two problems: "Two main sources of error that contribute to frequency difference include frequency offset between the two timing sources and doppler effects due to movement of a mobile receiver [a cell phone]. In a CDMA system utilizing a RAKE receiver to demodulate multi-path signals, each received multi-path signal can contain a unique doppler effect as well as a common frequency offset component. The present invention provides a tracking mechanism for removing the effects of error due to frequency offset as well as compensation for frequency error due to doppler in a plurality of multi-path signals." Column 4, lines 50-60.

That CDMA multi-path art is vastly different from the present invention, which is directed to <u>cable and satellite</u> broadband receivers. First, the multi-path diversity problem does not arise in the present context, because in the cable context there is truly only one (wired) path, and in the satellite context the transponder is relatively so far away that only a single signal is distinguishable. Accordingly, a RAKE receiver is not used.

Second, Sih teaches adjustments of the fingers in a RAKE for variations in Doppler shift: "The present invention provides a tracking mechanism for removing the effects of error due to frequency offset as well as compensation for frequency error due to doppler in a plurality of multi-path signals." Sih Abstract. Kuo is also directed to a RAKE receiver; "This invention proposes a new scheme that improves the rake receiver design for CDMA systems." Column 2, lines 62-63. See also Figs. 2 and 3 of Kuo.

2. Sih et al. Do Not Suggest Drift Compensation Across Multiple Different Carrier Signals.

The present invention concerns cable and satellite receivers, and thus is not concerned with multi-path or diversity issues pertaining to one traffic or content signal. Rather, the present invention pertains to improved frequency adjustments for receiving and, "concurrently processing content from multiple transponders and/or QAMs" (paragraph [0010], emphasis added) in a manner that reduces cost by sharing portions of the receiver system across multiple signals. Thus the present invention is directed to concurrent demodulation of multiple different carrier signals, rather than receiving multiple-path instances of the same signal, as in the prior art cited by the Examiner.

A system in accordance with the present disclosure reduces cost by sharing certain hardware across the multiple different carrier signals received from a common satellite dish or cable source, as illustrated in Fig. 2a:

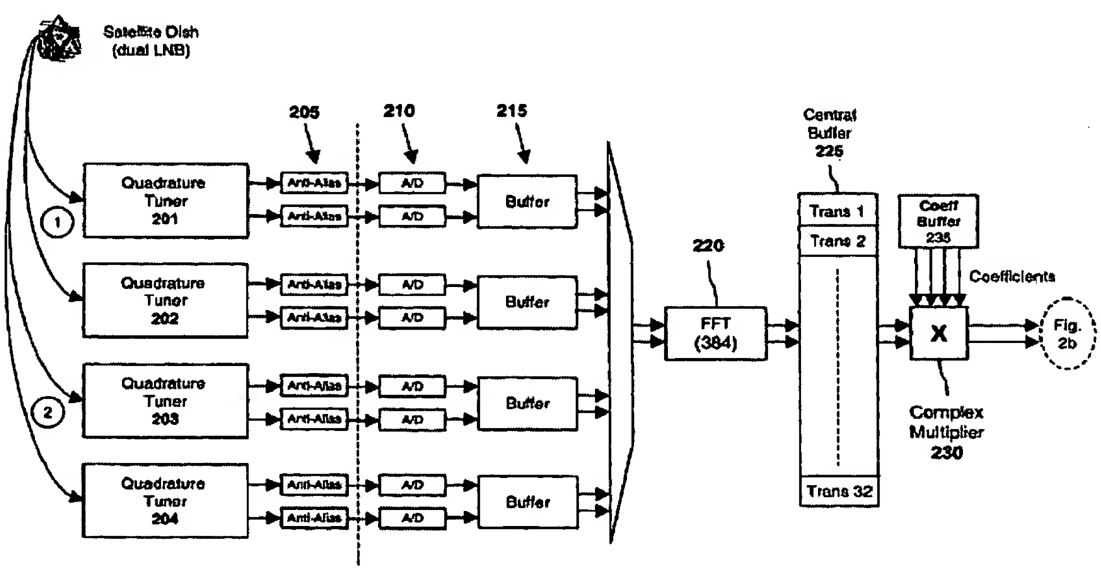

Fig. 2a

In the example of Fig. 2a, note the Satellite Dish has two LNB's (low noise block downcoverters), each one providing a pair of carrier signals to a corresponding Quadrature Tuner (201-204). Thus, each LNB provides a group (in this case two) of different carrier signals to separate tuners. Note circled references 1and 2 indicating first and second groups of carrier signals, each corresponding to a respective LNB. Each transponder or carrier has its own nominal or optimal frequency value.

Compare Sih, which addresses a different problem: Sih et al. take ONE received baseband signal (Q+I) and delivery it to rotators 706A-706N. The rotated I and Q samples are delivered to fingers 700A-700N, respectively, to determine frequency errors. See column 6, lines 13 et seq. These errors are averaged, and the result is used to adjust the tuner frequency (VCO). There is only <u>one</u> tuner and only <u>one</u> frequency of interest, because there is only <u>one</u> carrier signal in the frequency tracking loop taught by Sih et al.

In the context of the present application, multiple carriers are received. Each carrier has its own tuner (201-204 in Fig. 2a) and its own frequency. Paragraph [0039] discloses:

> "As illustrated in FIG. 2, one embodiment of the invention is comprised of a plurality of quadrature tuners 201-204, each of which lock on to signals transmitted by a plurality of transponders, downconvert the signals to baseband, and separate the in-phase ("I") and quadrature phase ("Q") components of the signals. In one embodiment, the entire group of transponders employed on the satellite system are allocated across the tuners 201-204. Accordingly, for a 32 transponder system, each of the quadrature tuners 201-204 process data streams from 8 transponders. Two of the tuners (e.g., 201-202) process signals from the first satellite LNB and the other two tuners (e.g., 203-204) process signals from the second satellite LNB, at first and second polarizations, respectively. More specifically, in one embodiment, each of the tuners 201-204 processes a 250 MHz chunk of transponder spectrum, resulting in 8 baseband signals having data from -125 MHz to +125 MHz. It should be noted, however, that the underlying principles of the invention are not limited to any particular number of tuners or any particular transponder/bandwidth allocation among the tuners."

The concepts of drift in receivers and closed-loop frequency tracking in general are admittedly known. What is key here, and dramatically different from the prior art, is the calculation and application of error signals averaged over multiple different carrier signals.

In the illustrative embodiment of Fig. 4 below, for example, "for each carrier or baseband signal, following the linear interpolator, the signal is passed through a carrier removal module 250 which removes the carrier offset from the signal using a periodic signal (e.g., a sinusoid) supplied by a Numerically Controlled Oscillator ("NCO") 252." See paragraph [0058]. The detected or actual frequency for the one carrier loop shown explicitly is shown as stored in Register **430**.

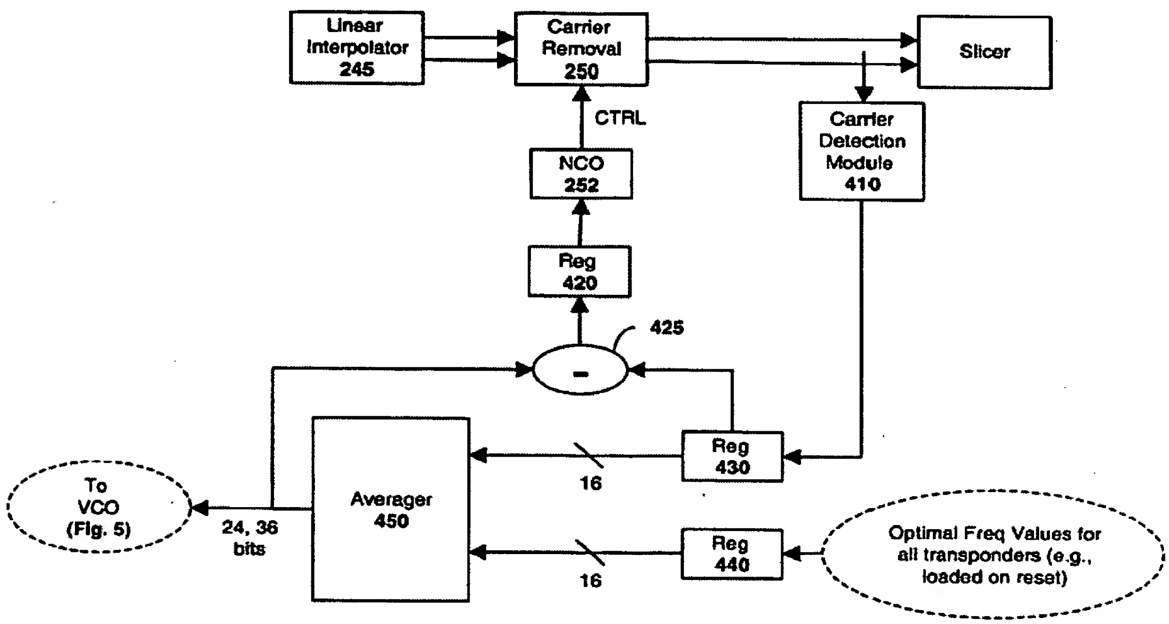

Fig. 4

The respective "Optimal Frequency Values" for all of the carriers (transponders) are stored as indicated in a Register 440. The specification explains, "To compensate for signal drift, following the linear interpolator 245, one embodiment of the invention employs the system illustrated in FIG. 4. According to this embodiment, a carrier detection module 410 detects the frequency of the carrier signal from each transponder and stores the results in a register 430. An averager unit 450 calculates the average difference between the actual frequency signals from each transponder (read from register 440) and the desired frequency values for each transponder (i.e., assuming no drift)." See paragraph [0059].

Thus, in this example, frequency errors are calculated and averaged over a group of multiple different carriers, which is quite different from comparing diversity receiver instances of a single carrier. Finally, the averaged error signal, which is provided back to the

VCO of a PLL "which generates the center frequency of each of the tuners 201-204 at the front end of the receiver." [0060] This system and method are neither disclosed nor suggested by the prior art of record.

Claim 1 is currently amended as follows:

1. (Currently amended) A multimedia receiver system which provides drift compensation for a plurality of different satellite transponder signals or cable/broadcast signals ("multimedia signals") received over a common low-noise block downconverter (LNB) comprising:

a system-level drift calculation logic to calculate an average drift amount ~~for each~~ among said multimedia ~~signal~~ signals in a first group of multimedia signals received over a common LNB; and

a system-level drift correction logic to correct drift of each of said first group of multimedia signals based on said average drift amount.

Thus the claim is clearly distinguished over the prior art for at least the reasons discussed. The dependent claims are patentable as well. While the prior art may show difference error calculations and averaging in a different context, as explained, the art of record does not suggest the subject matter claimed here.

The Examiner stated regarding claims 5, 17, 25 and 34 that Sih teaches wherein said first and second group of signals are from first and second LNB, citing to reference numbers 206,212 in Fig. 2 (of Sih et al. See Office Action page 7, second full paragraph). Applicant disagrees; the cited figure 2 shows a classic receiver front end (i.e., tuner) block diagram, including an RF Mixer (206) and IF Mixer (212). These two mixers work in tandem to downconvert one signal in one channel; they are both part of a *single* tuner. Thus, even if a mixer were considered a downconverter, the figure does not show a *second* LNB at all.

Claim 5 depends from Claim 4, which is currently amended to read as follows:

4. (Currently amended) The system as in claim 1 further comprising:

additional system-level drift calculation logic to calculate ~~an~~ a second average drift amount for a second group of multimedia signals received over a second LNB; and

second system-level drift correction logic to correct drift of each of said multimedia signals in said second group by said second average drift amount.

Regarding Claim 12, note that this claim as amended is directed to:

"a carrier analysis module to measure a signal characteristic of each of a plurality of satellite transponder signals or cable/broadcast signals provided by a common LNB…". A similar limitation previously appeared in claim 17, now canceled.

As discussed above, the prior art of record merely discloses a tracking loop (and RAKE filter) for a single carrier. Moreover, the prior art does not suggest, "an averager module to calculate an average difference between each of said measured signal characteristics and ~~one or more~~ respective desired signal characteristics…".

Moreover, in claim 13, "said signal characteristic is a measured frequency of each of said carrier signals and said desired signal characteristic is a specified frequency for each of said carrier signals." The prior art of record does not address "group" drift correction over multiple signals each having a corresponding specified frequency. In a RAKE filter, for example, all of the fingers have a common nominal or target frequency. Additional dependent claims add more detail, including for example "individual carrier signal correction logic for correcting said signal characteristic for an individual signal carrier based on a difference between said signal characteristic for said signal carrier and said average difference." (Quoting claim 15.)

Independent Claim 21 is amended to clarify that it pertains to a method for correcting drift for a plurality of different multimedia signals, rather than instances of one signal as in a RAKE filter. It should be allowed, along with the claims that depend from it.

As to claims 6, 18, 26 and 35 in particular, these claims are patentable at least for the reasons articulated with regard to the corresponding base claims. The Examiner cites "difference logic 500" as shown in the fingers of the RAKE filter circuit of Sih et al. Applicant again would point out that such do not disclose the invention claimed here for reasons already stated, which will not be unduly repeated.

As to claims 9, 10 and 19, they are patentable at least for the reasons articulated with regard to the corresponding base claims.

As to claims 7, 8, 14, 27, 36 and 37, these too are believed patentable at least for the reasons articulated with regard to the corresponding base claims. Certain particulars such as PLL's are know in prior art in other contexts.

For the foregoing reasons, the pending claims should be allowed. The undersigned would welcome a telephone call for the Examiner to discuss any issues that might remain.

Respectfully submitted,

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